

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

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In the Matter of)

Amendment of the Commission's Rules to)
Provide for Unlicensed NII/SUPERNet)
Operations in the 5 GHz Frequency Range)

ET Docket No. 96-102

RM-8648

RM-8653

COMMENTS OF THE HEWLETT-PACKARD COMPANY

Hewlett-Packard Company ("HP") hereby submits its Comments on the above-mentioned proceeding.¹

HP is a \$31 billion global information technology company that manufactures measurement, computation and medical equipment. The company envisions a merging of measurement, computing and communications technologies that will revolutionize the way people gather and share information. HP believes that applications that are available today provide only a glimpse of what will be realized in the near future. As new technologies are developed and perfected, HP anticipates that consumers will demand an ever increasing variety of choices and levels of sophistication in meeting their communications needs. Clearly, unlicensed wireless devices will

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¹ Amendment of the Commission's Rules to Provide for Unlicensed NII/SUPERNet Operations in the 5 GHz Frequency Range. Notice of Proposed Rulemaking, ET Docket No. 96-102, RM-8648, RM-8653 (released May 6, 1996).

play a vitally important role in providing solutions to many current and future communications challenges.

I. THE PROPOSED ALLOCATION OF 350 MHz IN THE 5 GHz BAND IS IMPORTANT TO THE FUTURE OF HIGH SPEED WIRELESS COMMUNICATIONS

HP strongly supports the Federal Communications Commission's ("FCC" or "Commission") proposed allocation of 350 MHz in the 5 GHz band for new wireless uses.

HP concurs with the Commission that allocating 350 MHz of spectrum in the 5 GHz band will "benefit a vast number of users, including educational, medical, business and industrial users."² HP is particularly enthusiastic about the possibilities of such an allocation in providing people everywhere with an array of new high-capacity wireless products and services. Access to the 5 GHz band will certainly make possible easier, faster and less costly methods for multiple users to access and exchange information from any location, without the physical obstacles of wired networks or bandwidth limitations of lower frequency unlicensed allocations. Personal multi-media devices, wireless LANs and point-point links on campuses and within communities are just some of the potential uses that would be ideally suited for the 5 GHz band.

II. HP RECOGNIZES THAT SOME MINIMAL RULES WILL BE NECESSARY TO PREVENT INTERFERENCE IN THE BAND, AND IT IS ESSENTIAL THAT ANY SUCH REGULATIONS SUPPORT MULTI MEDIA COMMUNICATIONS

The original petitions filed by both WINForum and Apple Computer, Inc. sought the use of the 5 GHz band for multi-media communications:³ a concept widely supported by other commenters in the proceeding as well as the Commission itself. HP believes that uses of the 5 GHz band should not be confined to any single medium -- voice, data and video transmissions will all be important

² Id. at Para. 33.

³ Id. at Para. 3, 4 and 5.

elements in making full use of this valuable spectrum. Therefore, HP strongly believes that it is essential that any regulations developed for the 5 GHz band support multi-media communications.

At the same time, HP believes that effective use of unlicensed spectrum may be dependent on a minimal set of rules that provides a framework for coexistence of devices and systems from a wide variety of manufacturers, delivering many types of service. Furthermore, the company concurs with the Commission that any such rules must be flexible enough to allow the widest possible number of applications to co-exist in the band, and to accommodate new technologies as they emerge.

a) THE PROPOSED INTERIM ETIQUETTE DOES NOT SUPPORT MULTI MEDIA COMMUNICATIONS, AND THEREFORE SHOULD NOT BE ADOPTED EVEN AS A TEMPORARY MEASURE

The Commission has proposed that an "interim" set of access rules or a "spectrum etiquette" be adopted "in order to expedite the development and introduction of NII/SUPERNet devices."⁴ The proposed interim etiquette is based on a "basic listen-before-talk" standard similar to the etiquette established for unlicensed data-PCS devices.⁵ HP agrees with the Commission's intent to expedite the deployment of products using the band, however the company is concerned that adoption of this etiquette, even on an interim basis may have the opposite effect. The "listen-before-talk" etiquette for data-PCS was designed specifically for asynchronous packet data communications, and is not suitable for multi-media communications consisting of both asynchronous and isochronous communications traffic.

⁴ Id. at Para. 52.

⁵ Id. at Para. 52.

Although in their original petitions, both WINForum and Apple Computer requested that NII/SUPERNet operations "be limited to packet based transmissions,"⁶ HP believes that this should not be interpreted to mean asynchronous packet data only. Certainly multi-media traffic will also consist of isochronous traffic such as voice and video, albeit in packet form.

HP's primary concern with the proposed interim etiquette is that it will introduce unacceptably high latency into isochronous communication. In order for isochronous communication to work it typically must be delivered within 10 milliseconds for audio and 100 milliseconds for video. The "listen-before-talk" proposed interim etiquette, has incorporated in it backoff and deference times which would result in unacceptable delays in the delivery of such isochronous traffic preventing the use of the band for multimedia communications.⁷

The Commission has pointed out the intended temporary nature of the use of the etiquette in its statement that the etiquette "would serve on an interim basis until an etiquette is developed by industry." However, rather than expediting the introduction of NII/SUPERNet devices, the adoption of a limiting interim etiquette would have the opposite effect. HP is concerned that companies would be deterred from designing multi-media systems until they could be certain that such systems could operate with the desired performance in the NII/SUPERNet band. Moreover, any newer etiquette developed by industry would have to be "backwardly compatible" with this interim etiquette, thus placing severe limitations on this.

⁶ Id. at Para. 38.

⁷ The High Performance Radio LAN (HIPERLAN) standard being developed in Europe would not operate efficiently under this etiquette.

Therefore, HP strongly urges the Commission to forego the adoption of the interim etiquette, and instead start with a clean slate by directing industry to develop whatever standards it deems are necessary through a consensus process within a fixed period.

b) IN ORDER FOR INDUSTRY TO DEVELOP AN ETIQUETTE PROPOSAL IN A TIMELY MANNER, THE FCC SHOULD ESTABLISH A FIXED PERIOD WITHIN WHICH INDUSTRY MUST COMPLETE ITS DELIBERATIONS

As noted above, HP recognizes that some plan for spectrum sharing will be necessary to fully use the band, and that the best place to develop such proposals rests with industry -- with the people responsible for designing and manufacturing the products to be deployed in the band. HP, for example, has some specific ideas about the kind of etiquette that might be most effective, and the company fully intends to actively participate in industry negotiations to develop spectrum etiquette plans that promote spectrum sharing and enhance efficient multi-media use of the 5 GHz band.

At the same time, HP believes that it is vitally important that the band be made available without unnecessary delay. HP suggests that the Commission give industry an appropriate fixed period--perhaps one year-- in which to complete its task. It is HP's hope that such industry discussions will yield a timely proposal that appropriately balances the benefits of a spectrum etiquette against the costs of unnecessary product delay.

III. MAXIMUM AND MINIMUM BANDWIDTH RESTRICTIONS

The Commission solicited comment on whether the specification of a maximum bandwidth should be established in order to ensure efficient use of the spectrum.⁸

If a maximum bandwidth restriction is implemented it should ensure that there are enough free sections of the band for a system to move to in order to avoid mutual interference. It is HP's belief

⁸ Notice of Proposed Rulemaking at Para. 51.

that it would be advantageous for any such bandwidth restrictions to allow for at least seven channels of the maximum bandwidth. This would enable a classic seven cell re-use pattern.

As a practical matter, such restrictions would only be useful in the lower part of the band which is not already subject to ISM band regulations. Using a seven channel plan as described above at the lower part of the band would equate to a maximum bandwidth of 25 MHz.

Assuming a modulation efficiency of 1bps/Hz, the maximum transmission rate would be 25 Mbps. Such transmission rates are typical for the type of multi-media systems described in the original WINForum and Apple petitions. Higher transmission rates are difficult at present, and HP believes that when such higher rates do become feasible radio technology will have matured sufficiently to enable transmission at higher carrier frequencies, such as 59-64 GHz where there is much greater bandwidth available. Consequently, HP supports a maximum bandwidth of 25 MHz.

HP supports a minimum bandwidth restriction of 10 MHz. A minimum bandwidth restriction would prevent the band from being used by narrowband systems which are already accommodated at other frequencies, such as asynchronous and isochronous PCS bands.

HP believes that applying maximum and minimum bandwidth restrictions as described above should simplify considerably the design of any etiquette for the band, and will increase the performance of multi-media communication systems operating under an etiquette.

IV. MODULATION EFFICIENCY REQUIREMENTS

The Commission sought comment on whether it should specify a minimum modulation efficiency requirement in order to avoid inefficient use of this spectrum.⁹

⁹ Id. at Para 53.

HP believes that both of the bandwidth restrictions proposed above should be coupled with a specified minimum modulation efficiency.

Furthermore, HP suggests a minimum modulation efficiency of around 0.66bps/Hz would be reasonable and practical. (The European DECT standard which is of low sophistication has a transmission rate of 1.152Mbit/s in a bandwidth of 1.728MHz which equates to a modulation efficiency 0.66bps/Hz). While specifying a high bandwidth efficiency does not necessarily guarantee a high spectral efficiency--as this is affected by the interference tolerance, multiple access and protocol efficiency--it can, at least, prevent low transmission rate systems from using the spectrum inefficiently.

V. CHANNELIZATION

While HP proposes application of bandwidth restrictions, the company does not propose channelizing the band unless industry comes to a consensus on to channelize and what would constitute suitable channel bandwidths through a deliberative process.

VI. INTERNATIONAL DEVICE AND SYSTEM COMPATIBILITY IS IMPORTANT IN ALLOWING U.S. COMPANIES TO DEPLOY NEW PRODUCTS GLOBALLY

HP supports the Commission's view that allocating 350 MHz of spectrum for broadband, wireless data networks will stimulate economic development and the growth of American industries, both domestically and abroad.¹⁰ The frequency bands being proposed by the Commission in this rulemaking offer a particularly important opportunity for U.S. companies in that they overlap with those used in the High Performance Radio LAN ("HIPERLAN") band in Europe. This will allow U.S. companies to offer products outside of the U.S. market, thereby increasing U.S. competitiveness in world markets.

¹⁰ Id. at Para 2.

The European Telecommunications Standards Institute ("ETSI") has developed operational rules for use of HIPERLAN frequencies, a process in which U.S. companies, including HP, have also participated. HP believes that because the HIPERLAN service rules process is nearly complete, it is important that it be used as a reference model to whatever rules are developed in the U.S. to ensure strong compatibility.

Global companies have an important need to ensure that their products can be designed, marketed and most importantly, used by consumers in all countries around the world.

VII. CONCLUSION

HP appreciates the Commission's efforts to date to make the 5 GHz band available for NII/SUPERNet devices. The company believes that this allocation will potentially provide important opportunities not only for U.S. industry, but also for ordinary people who will be able to use products in the band for a myriad of uses.

HP urges the Commission to ensure that the band supports multi-media communications. HP also believes that some minimal and flexible rules developed by industry will be necessary to ensure spectrum sharing by a wide variety of different systems. Consequently, the company strongly believes that the proposed interim etiquette should be dropped in favor of adoption of an etiquette developed by industry within a specified period of time -- perhaps one year.

Lastly, HP asserts that there should be maximum and minimum bandwidth restrictions, coupled with a specified modulation efficiency. However, the company does not support channelization unless industry can come to consensus on such a plan.

Respectfully submitted,

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